C-A Unreviewed Safety Issue (USI) Form

Title of USI: INSTALLATION OF NORMALIZATION TRIGGER COUNTERS AT PHENIX

Description of USI (use attachments if necessary):

Addition of fiber-readout scintillator counters between the endplates of the MVD and the brass nosecones for the pp-running at PHENIX. See attached memo for details.

Title and Date of Relevant SAD: Relativistic Heavy Ion Collider Safety Assessment Document (RHIC SAD), December 30, 1999

Committee Chair or ESHQ Division Head must initial all items. Leave no blanks:

ITEM	APPLIES	DOES NOT APPLY
Decision to not revise the current SAD and/or ASE at this time:	ETL	
The hazard associated with the proposed work or event is covered within an existing SAD and/or ASE.	ETL	
SAD Title and Date: RHIC SAD, 12-30-1999	ETL	
This Form and attachments, if necessary, shall be used to document the USI until the next revision of the appropriate SAD.	ETL	
Decision to submit a revised SAD and/or ASE to the BNL ESH Committee:		ETL
The hazard associated with the proposed work is not appropriately included in an SAD.		ETL

[illegible]
Signature of C-A Committee Chair or C-A ESHQ Division Head

July 3, 01
Date

Edward T Lessard
Signature of C-A Associate Chair for ESHQ

7-3-01
Date

TO: WILLIAM LENZ
FROM: BRENDAN FOX/ABHAY DESHPANDE (FOR THE PHENIX NTC GROUP)
DATE: JUNE 28, 2001

RE: NTC DETECTORS AT PHENIX

This memo is to inform you about the intention to install normalization trigger counters (NTCs) in the PHENIX IR for the proton-proton running period in 2001. This detector system consists of two, identical, fiber-readout scintillator counters. Each of these counters will be situated between the endplate of the MVD and the brass nosecone in the vertex region of the PHENIX detector -- one will be on the north side; the other will be on the south side of the PHENIX detector.

These detectors will provide:

(a) a normalization device with a greater coverage of the cross section than the existing BBCs. The latter sees about 70% of the cross section. With the NTCs, the figure is in the upper 80s. As a result of this increased coverage, the error in the total pp-cross section will be reduced significantly, thereby improving the ability to use the pp data to compare with the HI running. In addition, the knowledge of the relative luminosity of different bunches is critical for the spin program. This detector aids this effort by providing another measurement to compare with the ZDCs and BBCs coincidence rate and thereby assure that this critical quantity is measured correctly.

(b) a means for separating beam gas from beam-beam events by forming a coincidence between the counters on each end of the PHENIX detector,

(c) an efficient and clean trigger with a different bias than the other "standard" PHENIX triggers, thereby aiding with understanding the bias of the events collected during pp-running.

(d) a possible backup trigger for the muon arm. In the unlikely event that the muonID trigger board is not working at the time of the pp-running, the backup blue logic trigger for the muon arm needs to have some roadwidth device to reject the unacceptable rate of cosmic ray events. Quadrants of the NTC counters would provide the needed coincidence.

Figure 1 shows an assembly drawing for the NTCs. The scintillators are situated in the gap between the MVD and the nosecone and cover the radial area between the beam pipe and the outer ring of the MVD. The fibers from the scintillators run along the surface of the nosecone upto phototubes in one bundle per quadrant. The phototubes, along with the coupling enclosure for the fibers, are placed into an aluminum structure which is affixed to the nosecone.

Figures 2 through 4 show drawings for a single counter that would be installed on either end of the PHENIX detector. Such a counter is constructed from four 40x40 cm**2 by 5.1mm thick pieces of BC-404 (polyvinyltoluene-base) plastic scintillator into which 80 cm long, 1 mm thick Bicron BCF-92-WLS wave-shifting (polystyrene-base) fibers has been embedded in grooves cut into the surface of the scintillator material. The fibers are glued into place using BC-600 optical epoxy. At this time, the upper quadrants are glued to the lower quadrants to form halves. The halves are then light sealed via a wrapping made of a combination of BC-638 Black (0.2 mm thick, adhesive) Tape, BC-642 PTFE Reflector (0.08 mm thick, Teflon) Tape, and BC-620 Reflector Paint (titanium dioxide in a water base). To protect the surface and the fibers, the half will be encased by 10 mil (0.25 mm) thick stainless steel. The thickness of the resulting counter is not expected to exceed 9.5 mm. Since each half weighs only about two pounds, it is sufficient to attached them to MVD endplate at three points along the outer diameter via aluminum brackets and three points on the inner diameter via set screws attached to an aluminum extension to the inner diameter framework of MVD. This extension piece also protects the beam pipe.

The unattached ends of fibers from each quadrant of the counter are bundled together and, via either an air gap or a silicon rubber "cookie", optically coupled to Hamamatsu H6614-01 fine-mesh phototube with a factory-built and installed base that operates at a maximal voltage of -2500 V. As shown in Figure 5, each phototube will be placed into a delrin tube, one end of which will be attached to the fiber bundle and the other end to an endcap. This light-tight enclosure will be placed inside an aluminum tube which is mounted to the brass nosecone using existing holes present for attaching lifting straps to the nosecone. Due to the proximity of the phototubes to the helium bag, it is adviseable to vent the region around them to prevent an accidental accumulation of helium, a gas which is known to degrade their operation. For this purpose, air from the BBC compressed gas system will be flowed through the gap between the phototube enclosure and the outer aluminum tube. This air will be carried to aluminum structure via polyfill tubing and passed into the aluminum tube via a feed-thru located in near the back of the phototube.

The signals from the 8 phototubes are fed into the PHENIX data-acquisition system via approximately 8m long, Belden 8214 (RG-8 equivalent) cables. The HV will be supplied from the free channels on the existing BBC high-voltage LeCroy-built mainframe which is situated in an existing PHENIX rack with protection for water, smoke, and heat. The HV will be fed to the detectors via approximately 8m long plenum-rated, Belden RG-59, high-voltage cables with SHV connectors and will be run in a separate cable bundle to the phototubes. All cables will be stress relieved at two points, one on the phototube mount structure and the other on the bottom of the iron yoke of the magnet.

Since the space available between the MVD endplates and the nosecone is a few millimeters less than that needed for a useful NTC scintillator, it is necessary to gain a bit more space by altering the MVD cabling during the installation period. The principal limitation arises from the thickness of the MVD data readout cables and will be circumvented by constructing extension for these cables. Although the exact design of these extensions is still under consideration, the main features have been finalized. Specifically, the extension cables will be approximately 60 cm long and will be made from the same cable material presently being used for the MVD. But, for roughly half of the cable length, the existing insulation will be replaced by kapton tape. Since no male versions of the IDB connectors used for the MVD cabling exist, these extension cables will be attached to the existing MVD cables via IDB header connectors placed onto FR4 PC boards. These boards have no power and are being designed and manufactured by the BNL Instrumentation Department. Presently, prototype versions of these extension cables and PC boards are being manufactured to verify the reliability of these plan.

This necessary modification, nevertheless, may not be sufficient to provide the space for accommodating the NTC. For this reason, it is prudent to consider how to circumvent the next spatial limitation. This limitation arises from the low voltage cables which are presently routed along the MVD endplate through the gaps between the IDB connectors for the data readout cables. Since, in two regions of each bottom quadrant, it is necessary to place two cables into a single gap and the width of the gaps is smaller than twice the diameter of the low voltage cables, these cables cannot be laid flat against the MVD endplate. So, within the accuracy to which estimates of the available space can be made, the cables may encroach into the region required for the NTCs. As a first recourse to handle this possible problem, the top of release wings could be clipped off of the IDB connectors for the data cables. By widening the gap, this change would enable the low voltage cables to rest more flatly on the surface of the MVD endplate and thereby provide more room for the NTCs. If this alteration, however, also is not found to be insufficient, the profile of the low voltage cables could shaped to fit into the gap by redistributing the conductors inside the cable. This change would require replacing the outer shealth on the cable with kapton over approximately 20 cm of the cable. As a result of this change, the low voltage cables would lay underneath below that of the modified data readout cables. So, with these changes as possible recourses, along with the modification of the outer insulation of the data readout cables, it is clear that sufficient space is available between the nosecone and MVD to accomodate 9.5 mm thick NTCs.

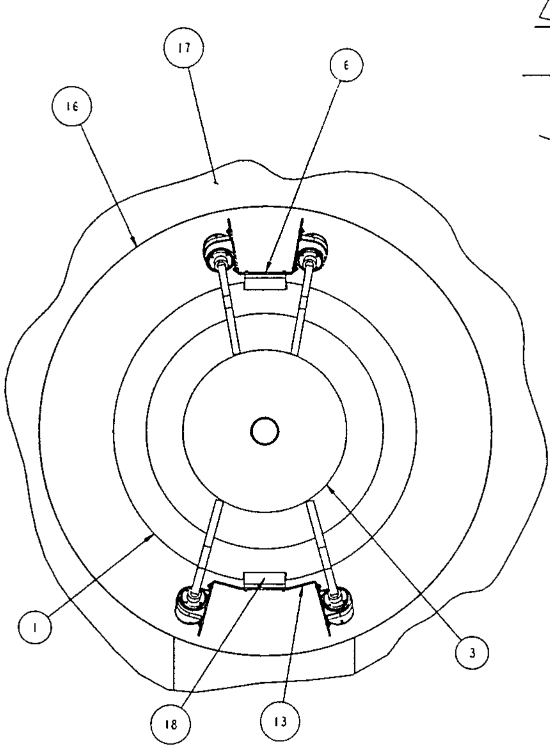
These counters will be installed between the heavy ion and proton-proton running this year (2001). To summarize the more detailed installation plan described in Appendix A, the installation procedure (in brief) is roughly:

(1) removal of the MVD
(2) addition of extension cables to the MVD data readout cables
(3) changing of the existing copper tubing for the MVD water cooling to flexible plastic tubing
(4) attachment of the NTC scintillators to the MVD endplates
(5) installation of the MVD
(6) attachment of the fibers from the NTC scintillators to the phototubes (1 phototube per quadrant)
(7) attachment of the phototubes to the brass nosecone

Principally, this procedure involves no more risk to the detector or beam pipe than the installation of the MVD. The latter task is already covered by existing safety procedures as documented in PHENIX Procedure Number PP-2.5.5.4-15.

ATTACHMENTS: Figure 1, assembly drawing for the NTC counters
Figure 2, schematic of a NTC counter

NOTES



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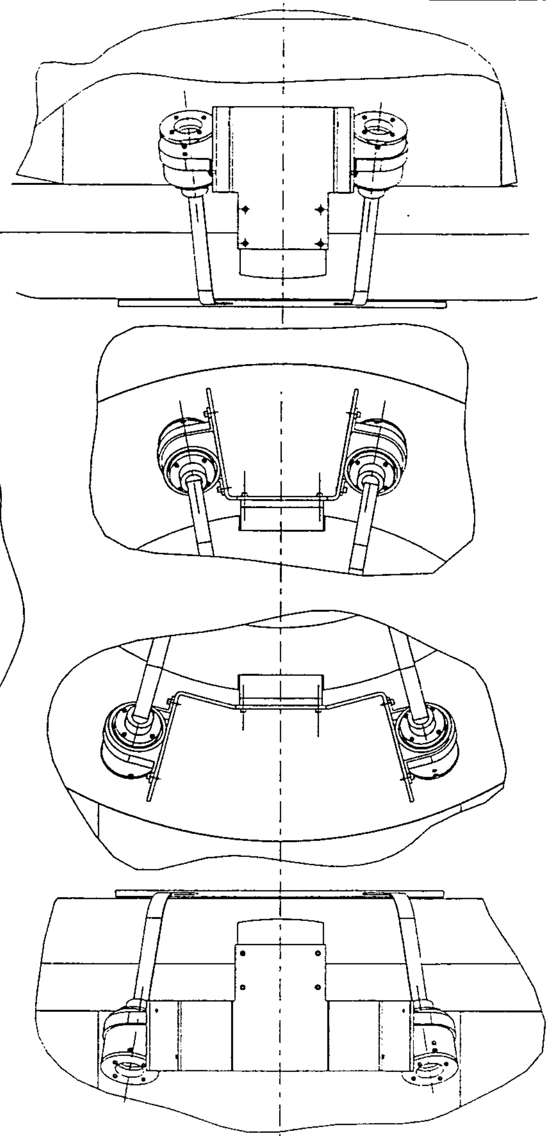
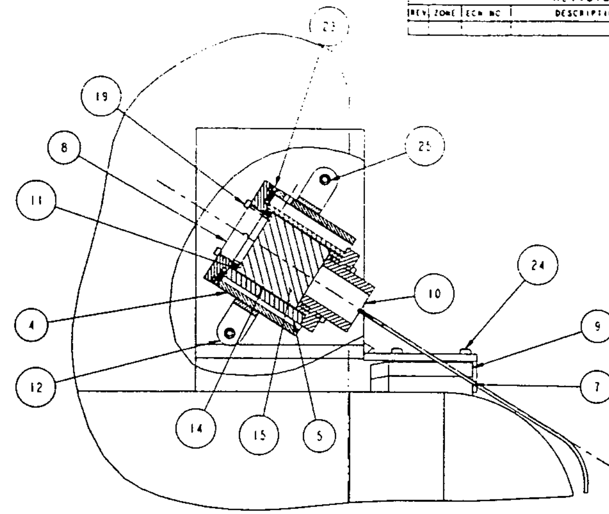




REV	ZONE	ECN NO	DESCRIPTION	BY	DATE	CAR	APP

REVISIONS

QTY PER ASSEMBLY	DET	QTY	DESCRIPTION	TYPE	PART NUMBER
	25	8	SHCS-0250-20_UNC-2A_X_50		
	24	8	SHCS-0250-20_UNC-2A		
	23	16	FHCS-10-32UNF-2A_X_50_LG		
	22	2	CABLE-RUN3		
	21	2	CABLE-RUN2		
	20	1	CABLE-RUN		
	19	32	8-32_UNC-2A_X_75_LG		
	18	2	0750-10_UNC-2A		
	17	1	CM-POLE-PIECE-PLUG1		REF.
	16	1	CM-POLE-PIECE-CENTER1		REF.
	15	4	PMT-		HAMAMATSU #6614-0
	14	4	FELT-RING		105-0218-020
	13	1	LOWER-MOUNTING-PLATE		105-0218-018
	12	4	PMT-STRAP		105-0218-016
	11	4	FOAM-PADDING		105-0218-015
	10	4	FIBER-COLLECTOR		105-0218-009
	9	2	NTC-MOUNTING-BLOCK-SPACER		105-0218-008
	8	4	CAP		105-0218-007
	7	2	NTC-MOUNTING-BLOCK		105-0218-006
	6	1	NTC-MOUNTING-PLATE		105-0218-005
	5	4	NTC-DELRIN-TUBE		105-0218-004
	4	4	NTC-ALUM-TUBE		105-0218-003
	3	1	NTC-DETECTOR-ASSEMBLY		105-0218-002
	2	1	NTC-MAIN-ASSEMBLY		105-0218-001
	1	1	COPPER-NOSE-CONE		002-0201-240

DWG NO 105-0218-001 SHEET 1 OF 1

OUTSTANDING ECN NUMBERS

INTERPRET IN GENERAL ACCORDANCE WITH ASME Y14.24M-1989

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
DECIMAL TOLERANCES
ANGULAR TOLERANCE

BREAK SHARP EDGES
FINISH NA NA 005

THIRD ANGLE PROJECTION

DRAWN BY	RUGGIERO	27-Jun-01
DESIGN APPROVAL	M. SIVERTZ	27-Jun-01
CHECKED BY	P. KROON	27-Jun-01
ENGINEER APPROVAL	P. KROON	27-Jun-01
SUPERVISOR APPROVAL		27-Jun-01
Q.A. APPROVAL		27-Jun-01

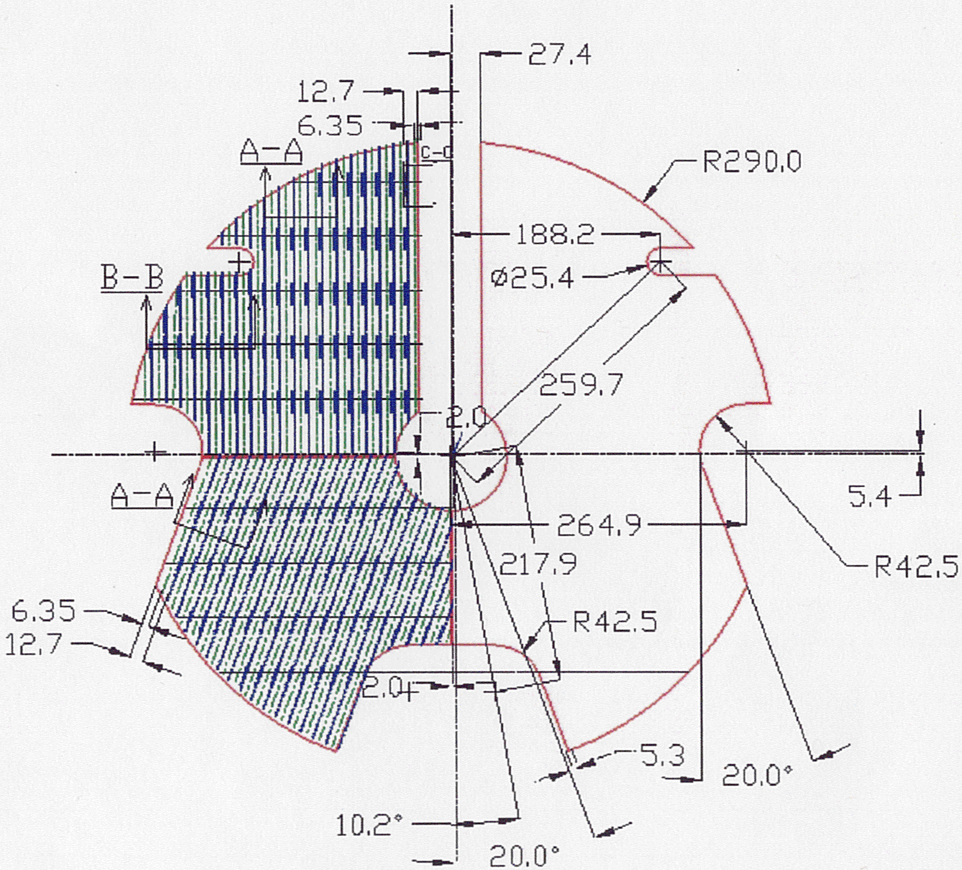
BROOKHAVEN NATIONAL LABORATORY

TITLE
PHENIX
NTC
NTC-MAIN-ASSEMBLY

SIZE D | DRAWING NUMBER 105-0218-001 | REV A

Q.A. CATEGORY A-3 | SCALE 0.250 | WEIGHT | SHEET 1 OF 1

NTC Drawing



Material: BC404 Scintillator with BCF-92-WLS fibers

Thickness 9.5mm, located at +/-40.0cm from IP

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